



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/510,602

05/13/2005

Jong-Po Jeon

8947-000116/US

1786

30593 7590 04/03/2007
HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 8910
RESTON, VA 20195

EXAMINER

KORNAKOV, MIKHAIL

ART UNIT

PAPER NUMBER

1746

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
--	-----------	---------------

3 MONTHS

04/03/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/510,602	JEON ET AL.	
	Examiner	Art Unit	
	Michael Kornakov	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/17/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/04/2007 has been entered.
2. Claims 1-9 are currently pending and examined on the merits.

Specification

3. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Claim 8 (original) recites "a pad-etched substrate", which is not disclosed in the instant specification. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Art Unit: 1746

6. The recited in claim 1 "hard to soft photoresist layers" constitutes an indefinite subject matter, since terms "hard" and "soft" are relative terms, which renders the claim indefinite. The terms "hard" and "soft" are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree.

7. The recited in claim 8 "a pad-etched substrate" constitutes an indefinite subject matter since it is not clear what is meant by "pad-etched" and the instant specification does not provide any description of the "pad-etched substrate". Therefore, the term "pad-etched substrate" is given the broadest interpretation.

8. Claims 2-9 are also rejected because of their dependency and failure to remove the ambiguity of parent claim 1.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

13. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tao (U.S. 6,242,350) in view of Wang (U.S. 6,409,932).

Tao teaches a method of ashing photoresist, which includes the steps of placing a wafer having photoresist pattern into the ashing tool; evacuating (vacuumizing) the ashing tool while the wafer is positioned within the ashing tool; introducing a forming gas into the ashing tool, the forming gas including nitrogen and hydrogen (reads on "a

Art Unit: 1746

gas processing step", as instantly recited); generating a plasma within the ashing tool to remove photoresist from the wafer surface (paragraph, bridging col.6 and 7). The teaching of Tao does not specifically indicate an in situ baking step, as recited in the instant claim 1.

Wang teaches conventional AVA wafer processing sequence, wherein the wafer is lowered onto a high temperature chuck (platen) of the processing chamber; the chuck heats the wafer up to the desired process temperature (reads on "baking step", as instantly claimed); the chamber is then pumped down to a desired process or treatment pressure; the process gases start to flow and plasma is ignited by a plasma source; after the photoresist has been removed, the chamber is then vented back to atmospheric pressure (760 Torr). Wang specifically indicates that **heat transfer between the chuck and the wafer occurs most efficiently at atmospheric pressure; therefore, wafers are usually heated up before pumping down the chamber** (col.2, lines 4-28). Therefore, since both Tao and Wang are concerned with ashing photoresist utilizing similar processing steps and Wang teaches the step of heating the wafer at atmospheric pressure up to the desired process (ashing) temperature followed by plasma ashing, one skilled in the art motivated by Wang would have found obvious to heat the wafer at atmospheric pressure upon placing it into the ashing tool in order to shorten plasma ashing time required for ashing the wafer in the teaching of Tao. With regard to the limitation reciting "hot plate", it is noted that the ashing tool conventionally includes a chuck or platen, which is heated and therefore reads on "hot plate". With regard to the limitation reciting "hard to soft photoresist

Art Unit: 1746

layers", since the photoresist of Tao is patterned and affected by plasma processing, the presence of hard and soft portions in such photoresist is reasonably expected.

With regard to claim 4, which is concerned with baking time, it is noted that this parameter is result effective since it affects semiconductor structure, which may be damaged due to overheating, and, on the other hand, duration of plasma ashing. Discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult In re Boesch and Slaney 205 USPQ 215 (CCPA 1980).

With regard to claims 2,3 Tao/Wang teach that the wafer should be heated to the desired processing temperature. Therefore, to determine the desired processing (ashing) temperature and to heat the wafer to this temperature under atmospheric pressure is within the skills of the ordinary skilled in the art and would be obvious.

With regard to claims 6-8, Tao teaches p-type silicon wafer, having a via- etched pattern.

14. Claims 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tao (U.S. 6,242,350) in view of Wang (U.S. 6,409,932) and in further view of Mohondro et al (U.S. 6,406,836).

The teaching of Tao/Wang remains silent about an overashing step. However, the overashing is conventionally utilized in the art in order to assure complete removal of photoresist and the other residual materials from wafer surfaces. Thus, Mohondro teaches that in order to remove residual material left after photoresist ashing, the ashing

Art Unit: 1746

step is followed by an overash step, utilizing the plasma previously generated at ashing, thus removing all polymeric materials from the semiconductor structure (col. 3, lines 35-40). Therefore, one skilled in the art motivated by Mohondro would have found obvious to proceed with overashing upon ashing in order to assure complete removal of photoresist and other polymeric residues while treating the wafer as per teaching of Tao/Wang.

Response to Arguments

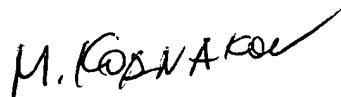
15. Applicant's arguments of 01/04/2007 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571) 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1746

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read "M. Kornakov", with a long, sweeping horizontal stroke extending to the right.

Michael Kornakov
Primary Examiner
Art Unit 1746

03/29/2007